



US005451965A

# United States Patent [19]

[11] Patent Number: 5,451,965

Matsumoto

[45] Date of Patent: Sep. 19, 1995

[54] **FLEXIBLE ANTENNA FOR A PERSONAL COMMUNICATIONS DEVICE**

[75] Inventor: Wataru Matsumoto, Gunma, Japan

[73] Assignee: Mitsubishi Denki Kabushiki Kaisha, Tokyo, Japan

[21] Appl. No.: 88,792

[22] Filed: Jul. 8, 1993

[30] **Foreign Application Priority Data**

Jul. 28, 1992 [JP] Japan ..... 4-201292

Feb. 3, 1993 [JP] Japan ..... 5-016173

[51] Int. Cl.<sup>6</sup> ..... H01Q 1/24

[52] U.S. Cl. .... 343/702; 343/741; 343/866

[58] Field of Search ..... 343/702, 741, 742, 866, 343/867; H01Q 1/24

[56] **References Cited**

**U.S. PATENT DOCUMENTS**

2,292,163	8/1942	Shea	343/702
2,313,231	3/1943	Forbes	343/702
4,471,493	9/1984	Schober	343/702
4,543,581	9/1985	Nemet	343/702
4,894,663	1/1990	Urbish et al.	343/702
4,992,799	2/1991	Garay	343/702

5,138,328	8/1992	Zibrik et al.	343/702
5,170,173	12/1992	Krenz et al.	343/702
5,258,892	11/1993	Stanton et al.	343/702
5,337,061	8/1994	Pye et al.	343/702

Primary Examiner—Donald Hajec

Assistant Examiner—Hoanganh Le

Attorney, Agent, or Firm—Wolf, Greenfield & Sacks

[57] **ABSTRACT**

An antenna for a portable radiotelephone which is configured in consideration of the nature of the electromagnetic wave and of the antenna-user relation in order to improve antenna performance in terms of received gain and directivity. Specifically, this is a multi-directional antenna configuration, including two or more planes of antenna oriented in different directions, for receiving electromagnetic waves in various angles or directions. The invention deals with at least two different cases in order to achieve satisfactory reception by a portable radiotelephone: when an antenna is relatively close to the user or a virtual ground, it should be provided normal to the user, and on the other hand, at another angle or parallel to the user when relatively far from the user or virtual ground.

3 Claims, 9 Drawing Sheets

